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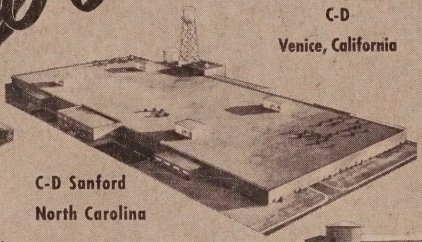

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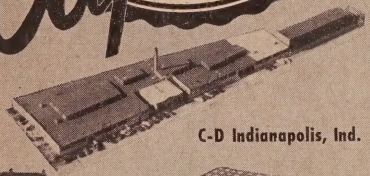

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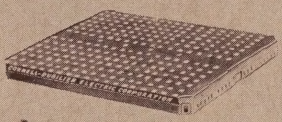

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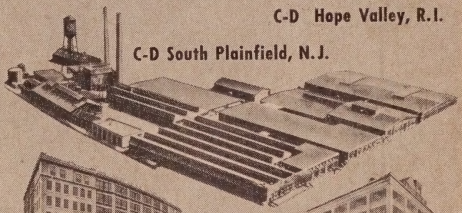

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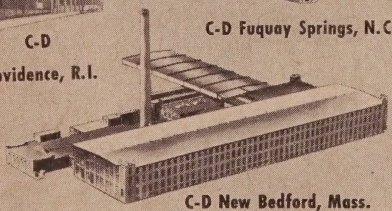

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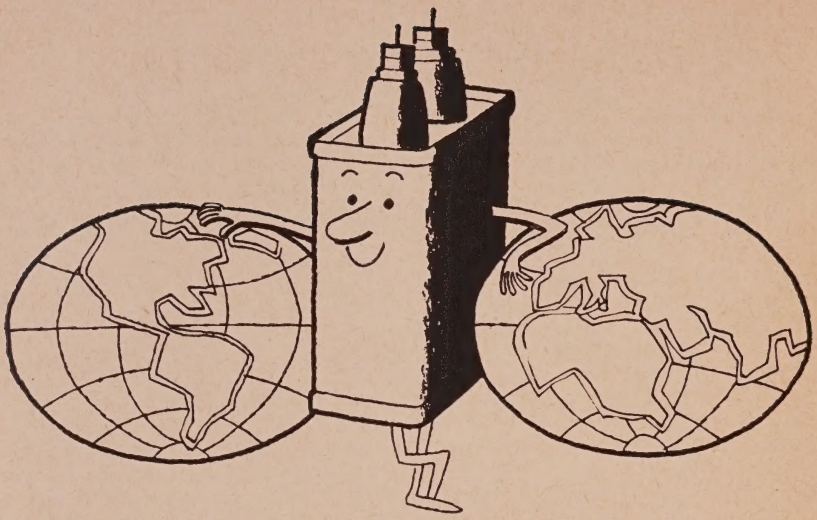

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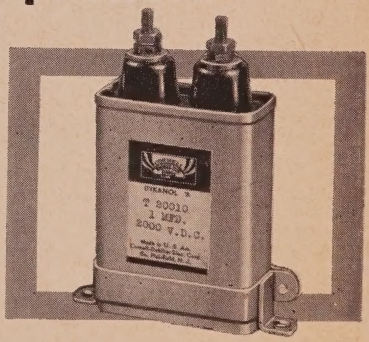

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HETERODYNE FREQUENCY METER

The **heterodyne frequency meter** is a versatile instrument for checking radio frequencies by the beat-note method. This device has a wide measuring range and is employed in both laboratories and radio stations. While it is a manipulatory type of instrument, the heterodyne frequency meter requires only the skill necessary to make use of the zero beating principle. Continuously variable by means of a single tuning control, this instrument may be made direct reading in kilocycles or megacycles.

The functional block diagram in Figure 2 illustrates the basic arrangement of the heterodyne frequency meter. In this circuit, a radio signal of unknown frequency is presented to an untuned detector, or mixer (B) simultaneously with a signal from a continuously-variable, calibrated r-f oscillator (A). When the oscillator is tuned close to the fundamental frequency of the unknown signal or to a harmonic or subharmonic of the signal frequency, a beat note is obtained. The beat note then is amplified by the audio-frequency amplifier (C) and is monitored by means of headphones, loudspeaker or some sort of visual beat-note indicator.

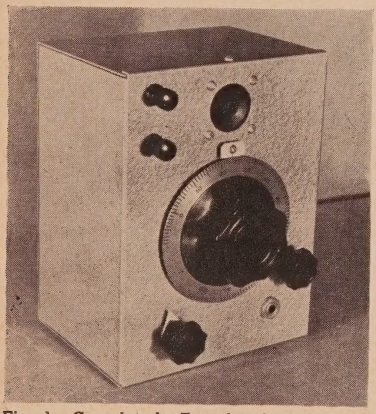

Fig. 1. Completed, Transistorized Heterodyne Frequency Meter.

The calibrated oscillator may be set to zero beat with the unknown signal, whereupon the oscillator calibration may be employed to identify the unknown frequency if the harmonic relationship between the beating signals is known. For general-purpose applications, it is convenient to make the r-f oscillator tunable from 500 to 1000 kc. Beat notes then will be produced with the fundamental frequencies of signals within this range. But also, beat notes conveniently will occur when the signal frequency (f_1) is lower than the oscillator frequency (f_2), provided f_2 is a harmonic of f_1. And beat notes will occur when f_1 is higher than f_2, provided f_1 is a harmonic of f_2.

As an example of this performance, consider the oscillator to be set to 600 kc. A direct beat note will be obtained with a 600-kc input signal. Note also that at this frequency setting of the oscillator it is possible to obtain a beat note against a signal at 300 kc because the 2nd harmonic of this signal is 600 kc, or at 150 kc since the 4th harmonic of this signal is 600 kc. Conversely, a 1200-kc signal will give a beat note because the 2nd harmonic of the oscillator setting is 1200 kc. Harmonics and subharmonics may be detected in this manner over a wide frequency range, to the point at which the harmonic energy is so low that the beat note cannot be heard readily. However, the oscillator needs only one range, and this single-range feature enhances its stability by avoiding the losses and drift attendant to all except the most elaborate frequency-switching systems.

When the oscillator range is set for

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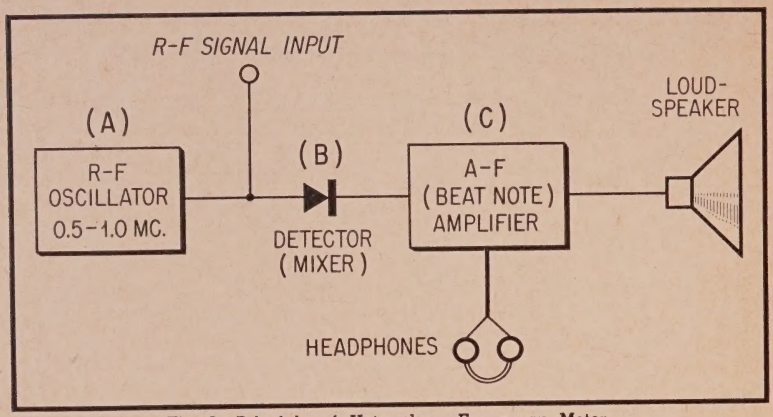

Fig. 2. Principle of Heterodyne Frequency Meter.

0.5-1 Mc, as indicated in Figure 2, the frequency measurement range of the instrument extends from 50 kc to approximately 30 Mc. Beyond 30 megacycles, the harmonics grow so weak as to be inaudible. For higher-frequency response, it is advisable to employ a higher-frequency oscillator range (e.g., 5 to 10 Mc). Heterodyne frequency meters intended for amateur station use generally have an oscillator tuning range corresponding approximately to the 160-meter (lowest-frequency) band. Since the lower ends of the amateur bands are in harmonic relation, this oscillator range permits measurement of all amateur frequencies up to the 28-Mc (10-meter) band.

Transistorized Instrument

The heterodyne frequency meter described in this article has been completely transistorized to permit economical battery operation. Divorcing the instrument from the power line provides fully portable operation, when needed, and removes hum and interaction difficulties. Battery life up to 400 hours may be expected. The single 6-volt battery that powers the instrument is composed of four 1½-volt, Size-D flashlight cells connected in series. Battery replacement thus is most inexpensive.

Figure 3 shows the complete circuit diagram. The oscillator employs an r-f transistor, V_1 (Raytheon 2N113). This transistor has an alpha cutoff frequency of 10 megacycles and therefore is an excellent oscillator within the 0.5-1-Mc range of the instrument base. A tickler-feedback type of oscillator circuit is employed. The coil assembly (L_1–L_2) is a commercial, transistor-type superheterodyne oscillator coil. The output coupling coil, L_3, is made by jumble-winding 20 turns of No. 24 dcc wire around one end of the L_1–L_2 unit.

Oscillator tuning is accomplished with a 365-uufd broadcast-type midget variable capacitor, C_2. The 50-uufd trimmer capacitor, C_1, serves as a calibration control for standardizing one point on the oscillator tuning dial. The oscillator tuning range is set by adjustment of the screw-type slug in the L_1–L_2 assembly. The d-c bias of the oscillator stage is stabilized by the voltage-divider network (R_1–R_2) and the by-passed emitter current-limiting resistor, R_3.

R-f energy from the oscillator is coupled, via pickup coil L_3, into the

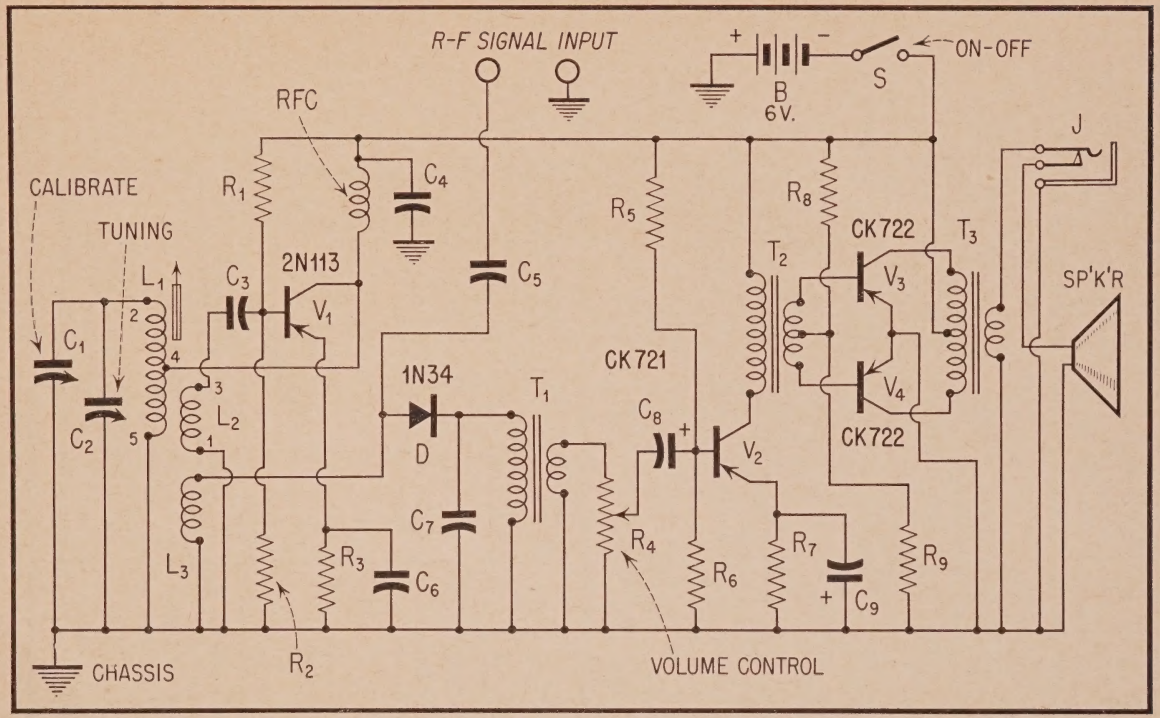

Fig. 3. Complete Circuit of Transistorized Heterodyne Frequency Meter.

mixer (detector) diode, D, along with the r-f input signal which is capacitance-coupled through C_5. The resultant audio beat note is coupled, through transformer T_1, to the high-gain audio amplifier.

The audio (beat-note) amplifier consists of a 2-stage circuit with single-ended driver and pushpull output. The driver (transistor V_2) is provided with stabilized bias through the voltage-divider network (R_5–R_6) and emitter current-limiting resistor R_7. The volume control potentiometer, R_4, sets the level of the beat-note voltage presented to transistor V_2.

The driver is transformer-coupled, through T_2, to the pushpull class-B output amplifier stage (transistors V_3 and V_4). This stage has a power output of 100 milliwatts. Both loudspeaker and headphone output are provided. When the headphone plug is inserted into jack J, the lifting of the upper jack spring opens the voice coil circuit to mute the loudspeaker. The d-c bias of the class-B stage is stabilized by the voltage-divider network, R_8–R_9.

Mechanical Construction

As it is shown in Figure 1, the heterodyne frequency meter is built in an aluminum chassis box 8" high, 6" wide, and 4½" deep (LMB No. 146). Roomy construction has been employed, but the reader can make his instrument smaller, if desired.

Figure 4 identifies the components appearing on the front panel in the photograph, Figure 1. The layout places the components in the best positions for easy manipulation. Trimmer capacitor C_3 is mounted inside the case and is adjusted with a screwdriver inserted through a clearance hole in the back of the case. The 4-inch tuning dial

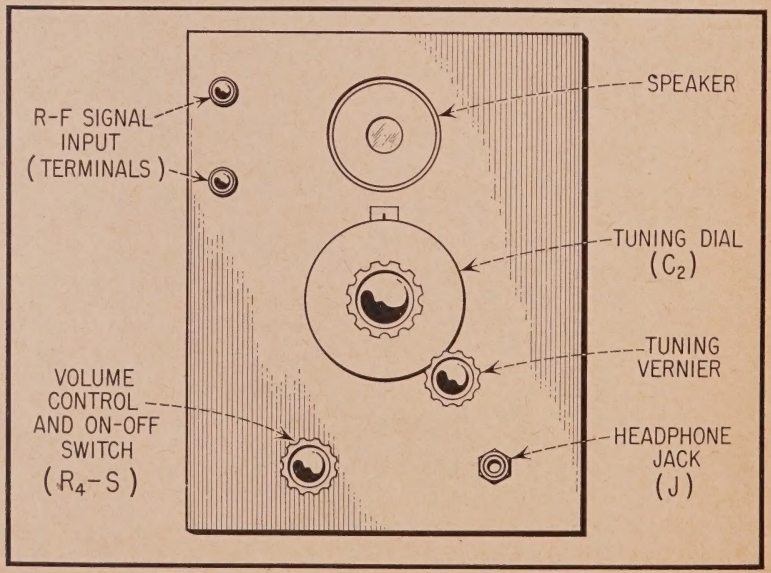

Fig. 4. Front-Panel Layout. (Compare with Fig. 1.)

attached to the shaft of variable capacitor C_2 has an auxiliary vernier drive.

A 1½"-diameter dynamic speaker has been used in the Editor's instrument and is seen at the top of the front panel in Figure 1. This speaker mounts behind a 1¼-inch hole cut with a conventional socket punch. This small speaker fits well into the layout, however, a larger speaker may be used. The 100-mw audio output of the class-B stage is sufficient to drive a 4- or 5-inch speaker with adequate volume for most applications of the frequency meter.

The three transistors (V_1, V_2, and V_3), diode D, and transformers T_1, T_2, and T_3 are mounted on a vertically-supported plastic subpanel 6" long, 2½" wide, and 3/16" thick, together with components C_3, C_4, C_5, C_6, C_7, C_8, C_9, R_1, R_2, R_3, R_5, R_6, R_7, R_8, R_9, and RFC. The ON-OFF switch (S) is combined with the volume control potentiometer, R_4. The four 1½-volt cells making up battery B are held to the floor of the case by a flexible, plastic strap.

The oscillator coil assembly, L_1–L_2–L_3, is mounted directly on the frame of tuning capacitor C_2, in order to secure the shortest, direct leads in the tuned circuit. The numbers shown on the terminals of this coil assembly are the ones used by the coil manufacturer to label this component. Follow this numbering exactly as shown in Figure 3 when wiring the circuit, otherwise the feedback polarity will be incorrect for oscillation. Trimmer capacitor C_1 also is mounted on the frame of tuning capacitor C_2. Rigid bus bar should be used for the connections between C_1 and C_2.

In wiring the circuit, run a solid ground lead through the entire unit. Do not depend upon the metal chassis to complete the ground connections.

The transistors may be plugged into miniature, 3-pin, in-line sockets or wired directly into the circuit. The latter method probably will appeal to most experimenters. However, when soldering transistors, hold the pigtail being worked on with pliers until the soldered joint has cooled completely, otherwise the transistor might be damaged by the heat. The same precaution must be observed when soldering the diode pigtails.

Transformers T_1, T_2, and T_3 must be mounted so that their cores are at right angles to each other. This minimizes magnetic coupling between them and reduces the possibility of annoying feedback.

Observe carefully the polarity of battery B and electrolytic capacitors C_8 and C_9. Also, identify the transistor terminals before inserting them into the circuit. The polarity of diode D is unimportant.

Calibration

After the wiring has been verified as correct, the unit must be calibrated. To do this, follow these steps: (1) Connect an accurate, unmodulated r-f signal generator to the R-F SIGNAL INPUT terminals. (2) Set the generator to 1000 kc and its output level to approximately 2000 microvolts. (3) Set C_2 about ½ of the way back from its minimum-capacitance position. (4) Screw the slug of L_1–L_2 all the way in. (5) Set volume control R_4 for maximum signal output. (6) Close switch S. (7) Adjust trimmer C_1 to tune-in the 1000-kc signal at exact zero beat. (8) Set the signal generator to 500 kc. (9) Tune C_2 to zero beat the 500-kc signal. If the signal cannot be reached, adjust the L_1–L_2 slug to tune it in, and repeat the 1000-kc adjustment. Then, return to the lower end of the dial and tune-in the 500-kc signal. After jockeying back and forth between these two adjustments, the 1000-kc signal may be set to the proper point on the dial by adjustment of C_1, and the 500-kc signal will fall into place on the dial without re-touching the C_1 calibration setting. (10) For higher accuracy, now replace

the signal generator with a 100-kc crystal oscillator. Readjust zero beat at the 1000 kc setting of the C_2 dial by tuning C_1. (11) Note now that the crystal oscillator provides spot signals at every 100-kc point (i.e., at 500, 600, 700, 800, 900, and 1000 kc). If the crystal unit has a 10-kc multi-vibrator, eight additional points will appear as spot frequencies between each adjacent pair of 100-kc points. (12) Prepare a dial scale or calibration curve for the tuning capacitor (C_2) dial.

The calibration of the instrument should be inspected occasionally, and trimmer C_1 readjusted to compensate for any drift that has occurred. This can be restricted to a single-point check, however, simply by re-setting C_2 to its 1000-kc position and tuning-in the calibration signal (1000 kc from the signal generator, or the 10th harmonic of a 100-kc crystal oscillator) and re-setting C_1 for zero beat.

Signal Input

When the instrument is in use, the r-f signal of unknown frequency may be applied to the circuit either by (1) connecting the signal source directly to the two R-F SIGNAL INPUT terminals, or (2) through a pickup antenna (usually a vertical whip or rod) attached to the left input terminal. It usually helps to ground the right input terminal.

PARTS LIST FOR FIGURE 3

B—6-volt battery (4 Size-D flashlight cells connected in series)

C_1—50 uufd midget variable — National UM50

C_2—365-uufd variable

C_3, C_4—0.01 ufd mica — Cornell-Dubilier 1D3S1

C_5—100 uufd mica — Cornell-Dubilier 22R5T1

C_6, C_7—0.005 ufd mica — Cornell-Dubilier 1W5D5

C_8, C_9—20 ufd, 25 v electrolytic — Cornell-Dubilier BBR20-25

D—General-purpose germanium diode — Raytheon 1N34

J—Miniature closed-circuit jack — Mallory A-2-A

L_1–L_2—Transistorized oscillator coil — Lafayette MS-265

L_3—20 turns No. 24 dcc wire jumble-wound around end of L_1–L_2

R_1—100K ½ watt carbon

R_2—27K ½ watt carbon

R_3—1000 ohms ½ watt carbon

R_4—10K wirewound potentiometer

R_5—10K ½ watt carbon

R_6—2200 ohms ½ watt carbon

R_7—820 ohms ½ watt carbon

R_8—4700 ohms ½ watt carbon

R_9—120 ohms ½ watt carbon

RFC—1-millihenry r-f choke

S—Spst switch on potentiometer R_4

SPKR—10-ohm, 1½"-diameter dynamic speaker — Argonne SK-61

T_1—Transistor-type interstage transformer — Argonne AR-104

T_2—Transistor-type class-B driver transformer — Argonne AR-109

T_3—Transistor-type class-B output transformer — Argonne AR-164

V_1—R-f transistor — Raytheon 2N113

V_2—High-alpha a-f transistor — Raytheon CK721

V_3, V_4—Medium-alpha a-f transistors — Raytheon CK722

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SELL OR TRADE — Amplifiers, test equipment, tubes, parts, speakers, TV's. Need some test equip., books, 17YP4. Wayne Schmidt, Wrightstown, Wis.

SELL OR TRADE — Pair of URC/4 transceivers, like new, $150; Riders Vols. 1 thru 21, $100 plus freight. Want U. S. stamps. J. P. Snow, 708 Chris Ave., Altus, Okla.

WANTED — Missionary in Central America requests donation of s.w. transmitter and/or receiver. Father Victor, O.F.M. Conv., Franciscan Missions, St. Francis Seminary, Staten Island 14, N. Y.

WANTED — Vibrator transformers, center tap, shielded or not. Cash or trade electronic gear and lab equipment. Bob Eubank, Box 9-231, Richmond, Va.

FOR SALE — Supreme 666 AF-RF signal generator; Precision E400 sweep gen., both like new, reasonable. George V. Hanold, Box 133, Wonewoc, Wis.

WANTED — To contact any builder of the GDO Adaptor per C-D Capacitor Aug., 55. Will answer all letters to compare results with ours. W. B. Sanford, 560 Walnut St., Fall River, Mass.

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FOR SALE — Weston: panel meters incl. 20 and 100 microamps, etc.; 430, 155 and 1 lab. meters; and multimeters. E. B. Pores, 2133 Central Dr. So., East Meadow, N. Y.

FOR SALE — Kay megasweep, $120; Precision E400, complete with crystals, manual, $90; battery powered Hickok microvolt S.G., in copper shielded portable case, $100; Hickok 288X, $80; Senior Voltohmist, $45. Fred E. Saron, 844 E. 13th St., Brooklyn 30, N. Y.

FOR SALE — Portable ultra-violet "Black Light" lamp, used in prospecting for uranium, minerals, etc., 3560 Angstroms units, $19.95. Zucco's Sales, 232 Liberty Ave., Cresson, Pa.

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WANTED — Radio-TV shop, strictly on invoice basis or will accept a partnership with high-caliber personality. Mike Horawa, 1741 East Eubanks, Oklahoma City 11, Okla.

FOR SALE — $750 worth of like new professional recording equipment: Gates CB11 turntable, Rek-O-Kut recording amp., gear mechanism, Presto 1-D cutter, 5 styli, all for $195 FOB. Wm. Kiewel, Crookston, Minn.

WANTED — Vertical transcriptions, certain early Associated numbers. Have for sale 3 Cook records, 10" #1041, "Speed the Parting Guest"; 10" #1070, "Rail Dynamics"; 12" #5010, "Calliope and Carousel." All three for $7.50, shipping extra. D. G. Pace, 12 Joyce Road, Plainview, L. I., N. Y.

FOR SALE — Seventy ten-cent coin-operated Dahlberg hospital pillow radios, originally $75 each — a steal at $1,750. L. A. Wilke, 170 So. Broadway, Empire, Ore.

FOR SALE — Approved A-710 AM-FM 12-tube tuner with A-620 power supply, $35; Magnavox AM-FM chassis with 20 w. amplifier and 15" coaxial speaker, $50. Prefer local buyer. J. Leonard Herron, 6340 Magnolia Ave., Chicago 40, Ill.

FOR SALE — Superior TV-11 tube tester, A-1 cond., oak cabinet, $40; Superior 670-A VOM, $25. Daniel Seidler, 4216 So. Washtenaw, Chicago 32, Ill.

WANTED — Schematic for Howard radio 718 FMX. Have 3 different TV schematics and service notes to trade. Selcraft, Box 394, Spring Valley, N. Y.

FOR SALE — Audax 16" transcription arm with Audax cartridge adaptor and GE .052 cartridge, $20 postpaid. Charles W. Leigh, 162 Passaic St., Trenton 8, N. J.

SWAP — Will do first-class printing in exchange for test equipment, tubes, recorder, electric drill, fans, ham radios, TV sets, etc. E. G. Bartlett, Atlanta, Mo.

WANTED — Motorola Airboy Jr. in working or repairable condition. Battery operated preferred. James J. Winger, Box 112, Hutsonville, Ill.

WANTED — Tape recorder in A-1 cond., GE cartridge 10-15-20 meter beam, rotator, crank-up tower, AF67, 4 mfd 4000 v. DC. Cash or trade electronic gear. K. Miller, 12612 Indianapolis St., Los Angeles 66, Calif.

FOR SALE — Telectro 880 tape recorder, $45; specifications on request; Heath C-3 condenser checker, $17.50; Superior TV-11 tube checker, $25; Heath T-3 tracer, $17.50. D. O. Marote, 159 Bonney St., New Bedford, Mass.

FOR SALE — Hickok 540 dynamic mutual conductance tube checker, good cond., with latest manual, portable case. Best offer. LeRoy Singer, 4 Atwood Road, Plainview, L. I., N. Y.

WANTED — Three (Atlas) model SM-12 parabolic baffles for 12" cone speakers or equivalent for cash or radio and TV items. John Arnold, Box 84, Bluffs 3, Ill.

TRADE — Unused Johnson 2-meter VFO, factory wired, in orig. carton, for good small screen TV 8-10". Lee Singleterry, 924 1st So., Seattle, Wash.

FOR SALE — Isolantite Amphenol subpanel mtg. sockets, chrome well, 3 hole mtg., circular dia with slight str edge; Simpson 260 VOM, 100 VTVM, 250 GE port. rcvr; 15,000 v. neon xfmrs. John Pellock, Benld, Ill.

WANTED — Handbooks: 2-5, 11, 15, 17-19; QST 12-15; 1921-25 callbooks. C. Fernandez, 81 Warren St., Roxbury 19, Mass.

TRADE — TS69 340-1000 mc freq. meter, FMTR-30D complete; Link 25v. FM less dyna.; WE J86205B power pack; FW3 handsets; 2-M xmitter per CQ Dec., 52. Want grid dipper, 14-18 mc rec. (Navy RAX 1, National). Joel Jones, 809 Cherry Dr., Jeffersonville, Ind.

FOR SALE — German Hi-Fi radio, 4 speakers, 8x10" woofer, two 6" middle cone speakers, 3" tweeter, 23" x 14" x 10" cabinet, four bands FM-AM, long and short wave, magic eye, $75 prepaid. R. Lackner, 2029 Bradley Pl., Chicago 18, Ill.

SWAP — Triplett model 630, 20K per volt, VOMA, perfect condition, $25 cash plus $10 net worth of standard brand, boxed, unused tubes of my choice. C. Elgasser, 1920 Fern St., San Diego 2, Calif.

WANT — VTVM, tube tester, AM-FM sig., oscilloscope, sweep sig., cond. tester. T. H. Heard, 10260 Oakland, Detroit 11, Mich.

FOR SALE — Super Pro rcvr with 10-meter band, (BC-779) power supply speaker, DB22A, $200 FOB. P. Boothroyd, Box 142-G, Sparta, N. J.

WANTED — TN-19, TN-54 tuning units part of APR-4 radar search rcvr. Cash, or trade for new amateur rcvr or xmitter. Also want ARC-1, ARC-3, BC-610-E, BC-614-E. T. C. Howard, Box 19, Boston 1, Mass.

WANTED — Superior powerstats, type 10, 1.25A, for cash or trade radio parts. Richard Rogers, 28 Bellamy St., Boston 35, Mass.

FOR SALE — Eico 400 scope, l. n., $30; Wen Electric 202 sander-polisher, perfect,, $10. Jack Stollman, 3003 Ave. 'X', Brooklyn, N. Y.

SWAP — RCA TV set, less tubes, CRT model 621TS, for used tube checker in reasonably good cond. Will not ship. Louis Tenebaum, 522 Ocean Ave., Brooklyn, N. Y.

FOR SALE — Custom made 834, 8-tube, for '55 DeSoto; in carton, also usable in '56 cars with drop resistor. M. T. Burkott, 9991 Albion Rd., N. Royalton, O.

FOR SALE — Used electromagnet power supply, good cond., input 120-240v, AC, output 115v, 1000 ma DC, 2 power xformers 4-5Z3 parallel hookup. Make cash offer over $35. August Luedtke, Lomira, Wis.

FOR SALE — Model GI-R85L LP disc recorder, mounted on steel chassis, $25 postpaid. Wm. R. Holleran, 323 Garland St., Pittsburgh 18, Pa.

FOR SALE — Pair, l. n. Wheeler sound power phones and ringers, $25. Eugene Cheney, Box 308, Nora Springs, Iowa.

FOR SALE — Sprague Kwik-Test KT1-, checks condensers while in circuit, l. n.; Heathkit VFO for both or sell separately. Fred Kloepper, Lawrence, Kan.

SWAP — Hickok 550X dynamic mutual conductance tube tester with built-in multimeter in portable case in good cond. Want DX 35 or equivalant xmitter. M. Goodman, 2621 Burns Pl., Union, N. J.

FOR SALE — Solar GE capacitor Exam-Eter, built-in VTVM to 600 v. Make offer. Have other test equip. E. N. Chrisiner, 313 Crawford St., Middletown, Ohio.

WANTED — Radio compass R5/ARN7 in any cond. for cash or trade electronic equipment. Rudolph Fannon, 134 High land St., Marlboro, Mass.

FOR SALE — Hickok 610 Universal TV alignment signal generator. Best offer. Nick A. Trianto, 3625 Fir St., East Chicago, Ind.

WANTED — Bird wattmeter. C. S. Damon, 4922 Wabash, Kansas City, Mo.

WANTED — Car radio for 1955 Oldsmobile with mounting panel, 12v, cash or trade 1949 Chevrolet for radio with cash. C. K. Schrader Radio Ser., 1720 2nd. Avenue So., Escanaba, Mich.

FOR SALE — Precision tube tester 10-54-P; EV 10 S multimtter, perfect working cond.; 125 boxed Radio-TV popular tubes, make offer. P. T. Pickei, 1585 Unionport Rd., Bronx 62, N. Y.

WANTED — Rek-O-Kut M-5-S professional 16" recorder overhead cutting mechanism with leadscrew and recording head, for cash. L. J. Schnedorf, 610 Monroe Ave., River Forest, Ill.

FOR SALE — Simpson 260 VOM perfect working cond., $28; rcvr S-38 l. n., $35, all fob. Gene Brizendine, 1001 Merritt St., Old Hickory, Tenn.

FOR SALE — 15" Stephens Hi-Fi speaker in mahogany bass reflex, $70; University 4401 Tweeter and 4405 Network, $10 additional. Marvin Kaplan, 2715 Broad St., Easton, Pa.

WANTED — 465 MC Citizens band radio equipment such as B6 645 and Vocaline xceivers. Electronic Service, 4918 Beech St., Hammond, Ind.

FOR SALE-TRADE — Clough-Brengle OMA sig. gen.; CRA scope; Riders manuals; Hammarlund Comet Pro short-wave rcvr; National NC-44 all-wave rcvr, other items. Glenn Watt, 415 W. First St. Chanute, Kan.

FOR SALE — Over 50 pieces assorted sockets, condensers, resistors, knobs, etc., $1.00 plus postage. George's Radio Repair, 3317 East St., Pittsburgh 14, Pa.

FOR SALE — 7EP4 tube l. n., $10; 5-tube amplifier, with phono and mike jack, $5; All types radio tubes. Ted Wasek, 40 Ackerson Ave., Pequannock, N. J.

WANTED — Precision tube tester 10-12P. Must be perfect. State lowest cash price. Louis Greenblatt, 144-40 77th Rd., Flushing, N. Y.

SELL OR SWAP — Tubes, crystals, Hi-voltage micas, variable condensers, radio parts. Want UHF converter. Oscar E. Hager, 102 Wherry Dr., White Sands P. G., N. M.

WANTED — BC474 inst. manual; GSAP camera manual, 16mm sound proj. Have 36" West. Elect. cone speaker and amplifier, perfect: original case, 30 years old; Antique cameras. M. J. Douglas, 1401 Amador, Concord, Calif.

SELL OR SWAP — Complete ARC-5 40-meter xmitter, with power supply, meter, and built in pi-network tuning, top cond., $25. Need good commercial xmitter (Globe Scout, Harvey-Wells, etc) Jason Birnholz, 634 High St., Newark 2, N. J.

WANTED — 2-meter converter. State particulars and price delivered. Sam Nash, R. 2, Box 97, Mays Landing, N. J.

FOR SALE — 2 Stewart-Warner Citizens band portafones, unused, complete with leather carrying cases and six fresh batteries. Both $10. York Marine Radio, Stonington, Conn.

FOR SALE — Heathkit 07 scope, extended range, push-pull vertical and horiz. amplifiers, 5" CRT complete. $30. H. R. Sinclair, 111 Lawndale, Elmhurst, Ill.

TRADE — $20 electric train for 2-meter or 6-meter converter or Heathkit VFO. Robert Kirk, 615 So. 16th, Parsons, Kan.

FOR SALE — Juke box, "Seeburg." Seeburg Radio, R. 1, Box 76, Elsinore, Calif.

WANTED — Schematic manuel for surplus electronic equipment, Vol. I, by Office of Technical Services, PB98487. Louis A. Josephson, 503 S. Copeland St., Tallahassee, Fla.

FOR SALE — National NC98 amateur rcvr, purchased in July, 1956. $135, prepaid. James W. Ariana, Box 285, Kincaid, Ill.

WANTED — Good Pair of binoculars, 7x50 or stronger, for cash or trade Feiler stethoscope signal tracer, l. n. Give full particulars. C. J. Reinisch, Box 259, Miller Place, N. Y.

FOR SALE — Gonset 6-meter mobile converter, $35. Want 3KP4 picture tube for Pilot 3" TV. Paul Merriman, 10038 Redmont Ave., Tujunga, Calif.

FOR SALE — Hallicrafter S-38-C comm. rcvr; Raytronic beamer CB-54-A, RCA sweep gen., covers both if freq. has separate reg. power supply. Best offer. Edward Tanrath, R. 2, Algonquin, Ill.

SELL OR SWAP — Like new in cartons. 27 Delco volume controls. J. Clifton Shears, N. Winchester Rd., Cresaptown, Md.

FOR SALE — IRE proceedings, Aug. 1949 to present, exc. cond. S. M. Sherman, 306 Colonial Ave., Moorestown, N. J.

FOR SALE — S-38C, best offer; 1922 amateur handbk, interior electric wiring, circuit analysis, $1.50 ea.; BC-412B radar scope, 115v AC., $18. J. Mofchak, R. 4, Lapeer, Mich.

WANTED — Heath VFO, and DX35 Central Electronics 10A or 10B; Lazy 811A Linear amp per SSB handbk or equiv. C. A. McKay, 4144 Meda Pass, Fort Wayne 6, Ind.

WANTED — Signal tracer, condenser checker, tube tester, in top flight cond. Give model, age, price. L. E. Salom, 724 Hunting Tower W, Alexandria, Va.

FOR SALE — 2 juke box amplifiers complete, in perfect working order; RCA studio mike that needs ribbon. A. Letcher, c-o Radio station KTNM, Tucumcari, N. M.

WANTED — Outboard motor—Evinrude or Johnson Seahorse, 15 HP or more, for cash or trade for TV. Troch's, 290 Main St., Spotswood, N. J.

WANTED — New or used disc recording and pressing equip. Baron's Sound Recording, 509 Front St. Lynden, Wash.

FOR SALE — Video Handbook, Radio Data Book — Boyce; Sams Photofact TV Course, Servicing TV Rcvrs — Philco; Modern Radio Servicing — Ghirardi, $2 each; TV for Radiomen — Noll; $3; Christy Appliance course, $5. Joseph Golab, 175 Hopkins Ave., Jersey City 3, N. J.

FOR SALE — Jackson CRO-2 scope, $150; TVG-2 Sweep and Marker gen., $160. Both like new, with manuals. W. W. Marsh, 219 N. Girard Ave., Minneapolis 5, Minn.

WANTED — 2-250 mmfd xmitting condensers (variable) with .077 air cap. Prefer National TMC 250. Albert Maddux, Box 322, Washington C. H., O.

SWAP — Johnson 2-meter factory wired VFO (never used) for good Heathkit scope or anything of amateur value. Mrs. Linda Shields, 1914 Ballinger Rd., Seattle, Wash.

FOR SALE — Garrard RC80 rec changer, in original container; 2 plug-in leads, 45 rpm spindle, no cartridges, $30 FOB. Walt J. Bartell, 5536 Wilson Ave. Chicago 30, Ill.

WANTED — Viking II, Johnson 122 VFO and matchbox. State cond., serial No., and price. Alfred Freitag, 6919 Chambers Rd., Baltimore 14, Md.

FOR SALE — Used AC-DC table model radios, tubes: 224, 27-26, 35c each postpaid. Underwood Typewriter, as is, $7.50 Goldstone Radio, 1279 Sheridan Ave., Bronx 56, N. Y.

WANTED — RCA TV chassis KCS47B less cabinet, yoke and picture tube. Ben's Radio, N. Tonawanda 2, N. Y.

FOR SALE — 16" Admiral Console Model 25A15, standard coil tuner — 26 tubes, powerful, nice set $19.95. Jones Radio Co., 1115 Rambler Ave., Pottstown, Pa.

WANT — Collins 32V-2, 3 also Harvey-Wells. Have for sale untouched BC221, Globe King 420w xmitter, HQ129X, Meissner sig. shifter, meters, tubes, power xformers. W. Armstrong, 18425 4th Ave., S. W., Seattle 66, Wash.

WANTED — For cash, multimeter that tests resistance up to 10 megs., uses flashlight batteries, and is in good shape. Ewell Churchill, Cord, Ark.

FOR SALE — Books: "Applied Practical Radio and TV," 6 vol. course by Coyne; "Servicing Superhets," Rider; "TV Simplified" and "FM Simplified," Kiver; "TV Servicing," Buschbaum; "Basic Television," Grob. Leonard E. Polikoff, 2464 E. 21st St., Brooklyn 35, N. Y.

FOR SALE — BC 224 rcvr, same as BC 348, only wired for 12 v., $35; 6 v. vibrator power supply, $5; 1.5 to 3 mc rcvr wired for AC $10. You pay shipping. Allen R. Curll, Box 607, Niceville, Fla.

SELL OR SWAP — Rival 35mm camera, case, flash, rangefinder, film, $35; GE PR-1 exposure meter, case $16. Want transconductance tube checker, 8 mm. projector, Kelsey printing press. Bruno DeCola, 379 S. Broadway, Salem, Ohio.

WANTED — Used 465MC Citzens two-way gear. Will swap or sell Harmony elec. Guitar, A1 shape. Vernon Kroh, New Salem, N. D.

FOR SALE — Precision tube and circuit tester 10-54; Superior super meter 670-A; Superior CRT tester TV-40; ART eliminator 610C-elic. Thomas Byrne, 331 Calhoun Ave., Bronx 65, N. Y.

WANT TO BUY — Shure 55, 55-S, 556, or 556-S dynamic microphone. Must be in excellent cond. Ted Hein, 418 Gregory, Rockford, Ill.

SWAP — Set of mechanics' hand tools in tool box, used very little, for SW rcvr. Also 1954 Silvertown auto radio universal mounting for broadcast rcvr in good cond. Edgar C. Lewis, Sunbury, N. C.

WANTED — Solar condenser checker CB-1-60 in working cond. State price. Steven Albert, 101-21 109 St., Richmond Hill 19, N. Y.

FOR SALE — Like new, Knight in circuit capacitor checker, $15 plus postage; Eico 320 sig. gen., never used, $18 or both for $30 plus postage. L. E. Smith, Route 1, Trion, Ga.

FOR SALE — Best offer. Geiger counter described in Jan. '55 Popular Electronics, perf. working cond. Needs battery. Eugene A. Frekko, 402 Queens Rd., Sanford, N. C.

SWAP — Simpson 260 ohms voltmeter, for Heathkit BE-4 or Eico 1050 battery eliminator 6 v. and 12 v. kit or wired. Donald Walker, 125 Guess St., Greenville, S. C.

WANTED — Two outside speakers able to carry 100 w.; Seco grid leak tester; 6 v., 12 v. DC power supply. Roy Goodwin, North Dr., R. 1, Ben Hill Station, Atlanta 11, Ga.

FOR SALE — AC operated instructograph in good working cond., 10 tapes and instruction book, $30 prepaid. George Phillips, Box 244, Nichols, Fla.

SELL OR SWAP — Precision 612 tube and battery tester, in A-1 cond., $35. Need AT-1 xmitter; Hallicrafters S-38D rcvr or good VTVM. Dave Deak, 363 Third St., Rankin, Pa.

SALE — 3-Command xmitters; 4-53MC (converted) two 7-9.1 mc. $6; Gonset tri-band converter, $25; power supply 750 v. 300 mil including 10 h. 30 ohm 400 mil choke. C. Gruber, 37 Birch Dr., Levittown, Pa.

FOR SALE — Precision EV 10 VTVM with RF probe; Clarostat 240 power resistor decade box; C-D capacitor bridge, all A-1 cond., $95. Kurt Eimer, 204 Elmwood Ave., Brooklyn 30, N. Y.

SELL OR SWAP — HQ-129-X with speaker, used slightly; 7JP4 picture tube; latest TV test equip., like new, want TV sets, midget radios, binocluars. John Rosol, 28 Winans Ave., Newark 3, N. J.

FOR SALE — Harvey-Wells TBS-50A xmitter, 160 through 2 meters, Phone and CW, 50 w., recently factory reconditioned; Heathkit VFO VF-1, excellent operating cond., both for $90. Vernon E. Hopler, 311 Dixon Ave., Boonton, N.J.

SELL OR TRADE — For comm. rcvr, ham gear or what have you, Strobonar VII electronic flash with D-pack; surplus Navy panadapter conv. for 110 v. AC 60 cycle power. Cal Johnson, W 1200 US Veterans Hospital, Rutland Heights, Mass.

FOR SALE — RCA UHF converter model UU2, uses 6BQ7 and 6CB6 tubes, like new, $20. Paul Kudrak, 478 Roseville Ave., Newark, N. J.

SELL OR TRADE — Unused picture tube 16AP4B, perf., $17.50 prepaid. Need signal tracer, or what have you. R. D. Rosenkrans, 2856 Isabella, Sioux City, Iowa.

FOR SALE — Latest HQ 129X with matching Jensen speaker, like new, $140; Lettine 240 xmitter, little used, $65; Vibroplex bug, $7.50; ElectroVoice 630 mike $20. Prefer local. J. Flanagan, 2 Roosevelt Towers, Apt 11, Cambridge, Mass.

CLOSING OUT — Tape recorders in orig. factory cartons, complete with mike, tape, etc. Jack Fives, 2916 Rockrose Ave., Baltimore 15, Md.

SELL OR TRADE — Hallicrafter S41, $15; ATR 6 v. battery eliminator, $15; Triplett sig. gen. 165 kc to 40 mc, $15; Webster 81-1 wire recorder with mike and wire, $35. Joseph Malak, 5164 Haverford, Lyndhurst 24, Ohio.

SWAP — Piano Accordion — 120 Bass, for Hi-Fi equipment. Prefer local. Andrew Wyckoff, 3514 Rochambeau Ave., Bronx 67, N. Y.

FOR SALE — 6 v. Vibra-Packs, $2.25; Weston 2½" meters, model 507, 1.2 ma. range, scale 0-100, $1.50. Chester J. Choszik, 6028 Larkins St., Detroit 10, Mich.

SELL OR SWAP — Aircraft xmitter AVR 20-A1; and AVT 112 rcvr; like new; 15" Altec - Lansing speaker; Paragon RA10 and Grede CR 13 rcvrs; TBX8 xceiver. J. North, 140 Sheridan Blvd., Inwood, L. I., N. Y.

FOR SALE OR TRADE — Standard coil UHF strips 22Q, 26K and Q, 27F, H, and K, 28Q, 33F, H, K, and Q. Cash price way below mfg. cost, or trade. Joel J. Atkins, 523 Whitestone Ave., Portsmouth, Va.

FOR SALE — Speech amp and modulator, with HV and LV power supplies and AC relay, on two enclosed amplifier chassis, $60 plus freight; Millen Grid-dipper coils 200 to 1050 and 925-2000 kc, each $3.50 postpaid. C. Jaray, 36 Flower Lane, Roslyn Heights, L. I., N. Y.

FOR SALE — Rider TV Manuals Vol. 1 thru 7, good cond., $50. Pay own freight. H. E. Hopper, 26 Oak Ridge Road, Ramsey, N. J.

WANTED — AC coil for National HRO-50T1 for cash. Bernard Shapiro, 1783 Marmion Ave., Bronx 60, N. Y.

SELL OR TRADE — Brunswick model 813 combination radio and phono, mfgd. by RCA, A-1 cond., is a collectors item. Radio Exchange, 1711 Pearl St., Boulder, Colo.

WANTED — 12S8 tube. Send COD to Demers Television & Appliance Co., 413 Chandler St., Worcester 2, Mass.

FOR SALE — Fairly new Triplett 630-A VOM, $35. J. O. Reece, 40 W Potomac, Lombard, Ill.

WANTED — Vol. 1 or first year's printing of Tell-A-Fault, by John F. Ryder. State price. Edward Ruditys, Story Road, Twin Oaks, Box 468, Chester, Pa.

FOR SALE — Two model 20 antique Atwater-Kent radios, with tubes, cabinets, $5 each; Precision E-200 sig. gen., like new, $35; Riders I 5 thru 14, $6 ea., or ten for $55. All FOB. Harold Garrett, 711 South New York, Sedalia, Mo.

SWAP — Photography issues, '49 to date; also VHF Regency OB-550 Cascode 2-stage booster, like new, for used TV, or what have you? Northwest Radio & TV, 5124 North 19th Ave., Phoenix, Ariz.

FOR SALE — Reconditioned 1937 to 57 auto radio, custom built. DeMarco Radio TV Shop, 193 Pine St., New Haven 13, Conn.

SELL OR SWAP — Philcophone model 901 intercom; RCA Hi-Fi model HF-6 radio chassis with tubes and spkr.; Masco MTB-13 TV booster; Capacitor magazine 1941-'56. Want appliance course, FM rec. or adopt.; late tube tester. I. W. Stubblebine, 140 So. 4th St., Reading, Pa.

FOR SALE — Like new 110 v. AC electric door alarm, complete, $27.50; unused Supreme TV manuals, each $1.50; N.U. pilot lights, most sizes; Vaco 2-in-1 screwdrivers, reasonable. G. D. Griffin, Box 343, Ithaca, N. Y.

FOR SALE — Link model 35 UFM-Ed 2 FM xmitter, 600 v. 150 mil dynamotor, 807 final, 6 v., $17.50. Ralph Saroyan, 1111 E. Weldon, Fresno 4, Calif.

SELL OR SWAP — Misc. radio and TV tubes for other tubes. Webster 78 rpm automatic record changer chassis, $12; Emerson 7" portable TV in operating cond., $25. Andrews, 740 Maple St., Bethlehem, Pa.

WANTED — 6 v. ATR power supply. State price and condition. M. Vincek, 117 Center St., Clifton, N. J.

TRADE — Will trade TV test equip. or ham equip. for 2¼ x 3¼ press camera. Roy C. Ragan, 2700 Park St., Arlington Heights, Ill.

SELL OR SWAP — Back issues of QST, Radio-TV News, General Radio Experimenter, C-D Capacitor, Successful Servicing, Hewlett-Packard News, CEC Recordings, Audio Record, Aerovox Research Worker, Amphenol Eng. News, and Sylvania News Tech. Sect. R. H. Ives, Rt. 2, Box 32, Lynnhaven, Va.

FOR SALE — High power components: Amertran 2½ KVA transformer with rectifiers and filter, $100; RCA modulation transformer, input, and pair 810's, $35; pair 250TH's, $20; some others. So. California only. Virgil Talbott, 9226 Alexander Ave., South Gate, Calif.

WANTED — CREI home study course, Sec. 1 and 2. Will trade both antique Atwater-Kent radio with steel cabinet and separate spkr., and 8" Altec spkr. in Hi-Fi cabinet . Will ship. Thomas G. Ravesi, 99 Rockridge Rd., Waltham 54, Mass.

FOR SALE — Jackson 103 tube tester, dynamic type, very good cond., with new roll chart and supplement, $25. J. Keithley, 18 Alton St., Aberdeen, Md.

WANTED — TS-251 for cash or trade BC-221. Also will swap Hickok 195 scope for test equip. Walter E. Noble, Box 505, Campbell, Calif.

FOR SALE — Two matched Shure 55-S microphones for binaural recording, like new, $75. R. Barton, 3130 NE 87 Pl., Portland 20, Ore.

FOR SALE — Complete kit of unused parts for 10-meter phone xmitter described in Oct., 1955 CQ, plus several transistors, $16. John J. Sturek, 4170 Lynd Ave., Arcadia, Calif.

SELL OR TRADE — Phone patch, $12; Feiler sig. tracing analyzer M.TS-2, $12; postcard printer, $3.50; 20X spotting scope, $4; Trav-Electric converter, M-1160, $11. All like new. Robert Gelnett, RD 2, Liverpool, Pa.

TRADE — RTS Radio-TV course. All lessons, books, less kits. Want comm. course, complete with all kits. Will pay difference. Ernest A. Sawyer, Box 346, Marshall, N. C.

WANTED — Instruc manual for Superior Instrument Co. sig. gen., model 1230. Will pay reasonable price and postage. M. E. Zwoster, 5708 Palatine Avenue, Seattle 3, Wash.

FOR SALE — BC-412 radar unit, with instructions and schematic circuit diagrams for simple conversion to high grade cathode ray oscilliscope, bargain at $39.50. Morris Halio, 3712 Cottage Ave., Baltimore 15, Md.

WANTED — Radio and TV Receiver Troubleshooting and Repair by Ghirardi, good cond., $4.75. Charles Piver, 117 Lee Ave., Washington 12, D. C.

SELL OR SWAP — Voightlander 9x12 cm. filmpack camera, Scopar F4/5,, Compur 1/200, ground-glass screen, leather case, exc. cond.; first-class radio transmitter parts. Want 35 mm. camera or cash. Arnold Ely, 2484 Michigan Ave., Niagara Falls, N. Y.

FOR SALE — Taco pole top booster Channel 5; Astatic 2-stage set booster, Channels 2 to 13; five element Yagi antenna Channel 5. Used but excellent. J. B. Henrichsen, Clark, S. D.

TRADE — Dodge or Chrysler auto radio, 1941 to 1949; Bausch & Lomb 6 x 30 (military) binoculars, for FM-AM tuner; encyclopedia. Will buy if necessary. Harry R. Beck, 2700 Fleetwood Avenue, Baltimore 14, Md.

FOR SALE — QST, Jan. '46 thru Dec. '55, $20; Service, March '49 thru Dec. '55, $5; Sams Photofacts folders 1 thru 7, loose, $3.50 postpaid. All in excellent condition. Veto M. Twaska, 3105 Bergman St., Pittsburgh 4, Pa.

FOR SALE — CR30 Cathode ray tube tester; ES 500A scope with SP5 probe set; Approved A-200 sig. gen. Best offer. Aloys Neussendorfer, 956 Cameron Ave., Pontiac 17, Mich.

FOR SALE — Eico 214 VTVM, $30; TC-55 tube tester, $20; xmitting tubes 807, 809, 811, 813, 100TH, 2-meter equipment. Want 4-250A or 4-400A tubes and sockets. Robert R. Campbell, 4810 Haddington Dr., Toledo 13, Ohio.

SELL OR SWAP — Motorola 7" TV, wood cabinet, latest type chassis TS-18, very good cond. Cash or ham gear. A. B. Witzl, 1645 Campbell Ave., Des Plaines, Ill.

WANTED — Custom auto radio for '54 Ford, with all parts for mounting in dash. Prefer unit in working condition. Carle D. Porter, 139 Holloway Road, Rochester 10, N. Y.

WANTED — Emergency band receiver, 30 to 50 and 152-172 mc bands, with squelch. Will trade misc. meters, trans., tubes. Local preferred. Joel S. Sonnabend, 35 Hadley Rd., Framingham, Mass.

SELL OR TRADE — AM-FM Granco radio, almost new, $19. Need good record changer and spkr enclosure. E. Gavin, 158-17 Sanford Ave., Flushing 58, N. Y.

WANTED — GE Ham News bound Vol. 1, good condition. James D. Smoyer, 11 Parkside Ave., Braintree 84, Mass.

FOR SALE — Slightly used Hickok 600A tube tester, best offer over $130. Also two 35 w. isolation transformers, $3.50 ea. Marvin Wise, 45 Fairlawn Ave., Albany, N. Y.

WANTED — Electronic key. State price, make, and condition. John Gubernard, 21 Arverne Terr., Irvington 11, N. J.

TRADE — IRE Proceedings July '55 thru Aug. '56, 1955 Directory, 1948-'53 cumulative index, $30, or for all-band amateur mobile whip. Have back issues of Tele-Tech, Radio-TV-Electronics, and others. Harvey Nations, R. 3, Chandler, N. C.

FOR SALE — Precise 300 scope, perfect operating cond., complete with leads and operating instructions, $65; Sprague KT-1 Kwik-Test capacitor checker, like new, with instructions, $20. James P. Torre, 101-48 120th St., Richmond Hill 19, N. Y.

FOR SALE — Heath model 0-8 scope with manual, A-1 cond., $35. Mac's Radio & TV, 116 W. Broad St., Linden, Mich.

FOR SALE — Aristo "Studio" model slide rule, German-made, for all math calculations, with top-grain leather case and instruction manual, like new, $20 or trade for Hi-Fi equip. M. Neidich, 198 Anstice, Oyster Bay, L. I., N. Y.

WANTED — BC-348; ARC-3; ARC-1, BC-788; BC-312. Tom Allen, 159 Carlton Ave., Brooklyn 5, N. Y.

SWAP — Hickok 156 traceometer, complete with tubes, cables and instructions for LM freq meter or BC-221. C. W. King, R. 1, Box 98-H, Sandston, Va.

SWAP — Precision E-200C sig. gen., l. n., for late model Heath or comm. 5" scope. Boston area only. L. McGeoghegan, Ortins Rd., Hamilton, Mass.

FOR SALE — Sams Photofacts Vols. 1 thru 21 in binders, $250; Web-Cor 81 wire recorder, like new with crystal mike, $50; Simpson 260 VOM, $25. All in A-1 condition. Jack Kenney, 101 E. Edsall Ave., Palisade Park, N. J.

FOR SALE — 3-speed model RT65 Bell Sound System tape recorder, instructions, tape, like new, $100. Aug. Palmmeo, 2230 South Winebiddle Avenue, Pittsburgh 24, Pa.

WANTED — Hallicrafters SX-62A with or without speaker. State condition and price. Albert Isokait, 41-65 75th St., Elmhurst 73, N. Y.

SELL OR TRADE — NRI model 112 R-C tester, fine cond.; RCA isolation transformer, both for $30, or trade for used typewriter in working cond. Ken's Radio Shop, 795 No. 10th Ave., Kankakee, Ill.

FOR SALE — Simpson 230 meter, $15; 6 v. input vibrator supply, $3; 6 or 12 v. input xmtr vibrator supply, $8; NRI model 1175B Triplett tester, $15. A. Bogart, 451 Oak St., Emporium, Pa.

WANTED — Good 2-meter rig transmitter and receiver, reasonable and in good condition. Charles Daringer, 401 - 7th Ave. SW, Oelwein, Iowa.

FOR SALE — T-17 microphone, $5; HS-33 headset, $5; step-down transformer, 250 VA, 440/220 three-phase, can step down from 220 v., $5. S. S. Brody, 211-10 73rd Ave., Flushing 64, N. Y.

FOR SALE — Riders Vol. 2 thru 5, Troubleshooters Vol. 29 and 31, Official Radio Service manual, like new. Best offer. Need G.D.O. John Nelson, 501 East Crescent Pkwy, South Plainfield, N. J.

FOR SALE — RCA Radiola 18 — real museum piece, in working order. Make offer. Droesch Radio-TV Service, Box 147, Burkettsville, Ohio.

SWAP — Meters, boosters, motors, fans, tubes; want comm. rec., surplus rec., or ?? Thomas Rohland, R. 3, Martinsville, Ind.

FOR SALE — Heath equip. with manuals: V-7 VTVM, $20; SG-8 RF sig. gen., $12; TC-2 portable tube checker, $22; all plus postage; DX-100 xmitter, no bugs, $185 (local sale). J. W. Eckenwiler, 1366 Grant St., Akron 1, Ohio.

FOR SALE — Halladorson 35 w. amp Kit, except speaker, $30; regular 25 w. amp. kit, except spkr, $25; Supreme 589A tube tester, $35; Heath V4A VTVM, $20 FOB. A. Agostino, 223 So. Winebiddle Ave., Pittsburgh 24, Pa.

SELL OR SWAP — Beck-Lee Electrocardiograph, designed by Charles F. Hindel, $100, or swap for good mutual conductance tube tester, or what have you? William J. McGee, 24 So. 33rd St., Philadelphia 4, Pa.

FOR SALE — Complete parts and maintenance manual for LF-MF-HF ARC-5 rcvrs and xmitters, $5, S-38B, good cond., $25; recorded code course, 0-20 wpm, on 36 ten-inch records, 72 sides, $20. W. E. Buffinton, 5208 Birkenhead Rd., Jacksonville 10, Fla.

WANTED — One V- or X-199 tube in good operating condition. State price postpaid. T. E. Dadson, Box 666, Franklin, Mich.

FOR SALE — Zenith auto radio, broadcast and short-wave band, good cond., lacks speaker, $15. Cordova, 133 Watkins St., Brooklyn, N. Y.

FOR SALE — Two Philco model UT21C UHF converters, in orig. factory cartons, $15 each, both for $27.50. Music City Radio & TV, 1252 Pendleton St., Greenville, S. C.

TRADE — Unused Geiger counter, probe type, for test equip., or what have you? G. E. Stowers, 2020 East 48th Terr., Kansas City 30, Mo.

SELL OR SWAP — 2" Waterman pocket scope; RCA color course; 3000 v. CT, 600 ma, plate transformer. A. Gantcher, 1973 81st St., Brooklyn 14, N. Y.

SELL OR SWAP — Motorola auto radio, model 700 in A-1 cond., for a good tube tester, or what have you? S. Kordek, 1 Arch St., North Brookfield, Mass.

FOR SALE — Assorted unused bathtub condensers, 15c each; 50K and 5K Clarostat pots, W.W., 4 w., 25c each; Tobe-Deutsch Oil Mite, 0.5 mfd, 600 v., 25c each. Libby's, 126 Bennett St., Staten Island, N. Y.

FOR SALE — 6-tube "Trad" coin-operated radios, metal cabinets, $15 FOB; 6-tube McGuires wood cabinets $10 FOB — guaranteed 90 days. B. Taylor, 1307 Vultee Blvd., Nashville, Tenn.

WANTED — Vols 2-5 ARRL handbooks, and Heathkit AT-1 xmitter, will swap TV booster, corner reflector. Robert Jones, 713 Front St., Catasauqua, Pa.

WANT — Patterson RP-16 receiver and any equipment manufactured by Mignon or Universal Wireless Corps. Have for sale spray rig, compressor, hose, gun, portable jig saw for 1/4" drill. Allen's Custom Electronics, 4313 East Grant Rd., Tucson, Ariz.

FOR SALE — Heath scope 0-10, $100, and sig. tracer T-3, $25; 7JP4 CRT $15; turret tuner, $15; Mallory vibrator 6VT1, factory wired, $20; transformers. F. Berry, 2203 Stevens Ave., Kalamazoo, Mich.

SELL OR TRADE — Eico 221 VTVM in exc. cond., with RF probe, $15, or trade for ham gear. Nathan Schulman, 78 Atkins Ave., Brooklyn 8, N. Y.

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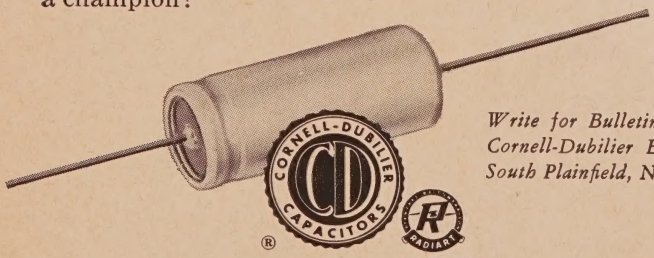

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